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A -80mmHg Single-Use Negative Pressure Wound Therapy System Reduces Surgical Site Infections: A Systematic Literature Review and Meta-Analysis

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Aims and objectives

Surgical site infections (SSIs) in orthopaedic and trauma patients can be devastating, leading to clinical sequelae that impart significant morbidity and mortality. SSIs can be categorised as per the Centers for Disease Control and Prevention (CDC)¹ definition based on the deepest tissue level affected into either superficial, deep or organ/space. Single-use negative pressure wound therapy (sNPWT) devices, such as the canisterless -80mmHg PICO[◇] (Smith and Nephew Medical Ltd; Hull, UK), are emerging as a promising technology for reducing SSIs, but its effect on each of these subcategories of infection in this patient population is unknown.

This study therefore aimed to **evaluate whether a specific -80mmHg sNPWT device can reduce the incidence of SSI in at-risk orthopaedics and trauma patients** with closed surgical incisions, compared with standard care.

Materials and Methods

Electronic databases including PubMed, Embase, and the Cochrane Library were systematically searched in July 2023. Included studies detailed outcomes following the use of a specific -80mmHg device compared with standard non-NPWT dressings in at-risk patients with closed surgical incisions post-orthopaedic/trauma surgery.

Table 1. PICO criteria for inclusion into the systematic literature review

Domain	Inclusion criteria	Exclusion criteria
Population	Orthopaedic/trauma patients having closed surgical incisions who were considered to be at high risk of developing a surgical site complication	Patients with open surgical incisions or any non-surgical wound
Intervention	PICO sNPWT (“-80 mmHg sNPWT”)	Other forms of NPWT, such as traditional NPWT or non-disposable devices, were excluded
Comparator	Standard conventional dressings (‘standard of care’)	Non-standard dressings
Outcome	Surgical site infection (according to Centers for Disease Control and Prevention criteria ¹)	Other clinical outcomes; non-clinical outcomes
Study design	All comparative clinical study designs were considered	Non-comparative clinical studies; benchtop or cadaver studies

Meta-analyses were carried out in R. Binary meta-analyses were performed using the ‘metabin’ function and reported using odds ratios (OR) with 95% confidence intervals (CI). A random effects model was used where heterogeneity (I²) met or exceeded 50% and a common effect model where heterogeneity was less than 50%.

Results

Out of 2,014 articles identified, 12 were included¹⁻¹² (6 randomised controlled trials; 6 non-randomised comparative studies). In total, the studies reported on 3743 patients, of which 1731 received the intervention and 2012 received conventional dressings. Ten studies reported on composite SSI rates, 5 reported superficial SSI and 4 reported deep SSI.

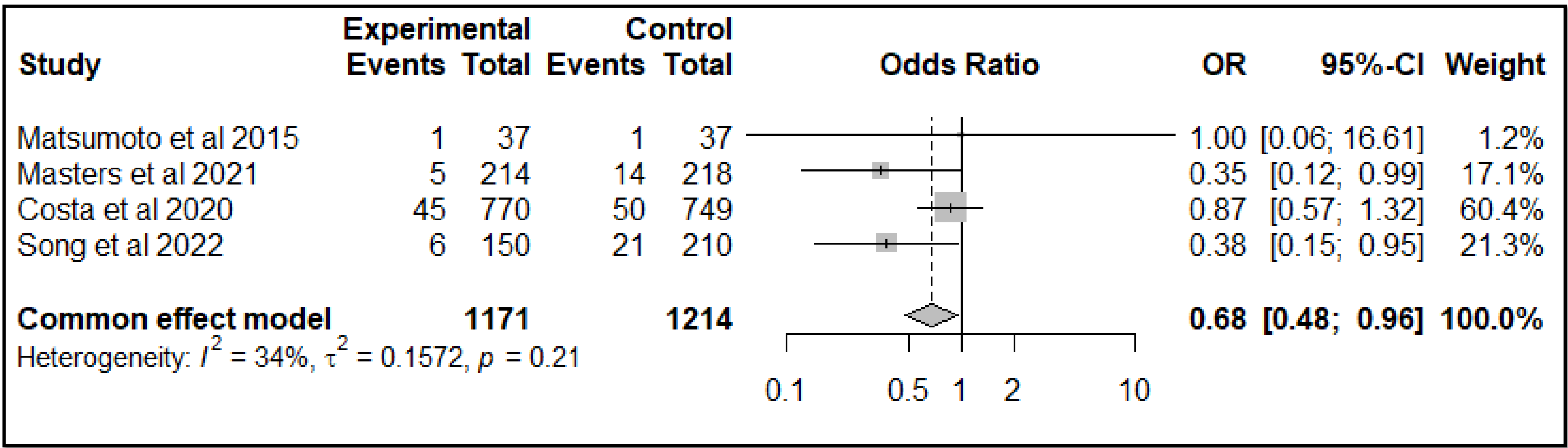


Figure 1. Forest plot showing -80mmHg sNPWT versus standard care for the deep SSI outcome.

A statistically significant improvement in the composite SSI (OR: 0.44; 95% CI: 0.30-0.86), superficial SSI (OR: 0.06; 95% CI: 0.01-0.43), and deep SSI (OR: 0.68; 95% CI: 0.48-0.96) outcomes was observed with the sNPWT device compared with standard care. Insufficient data were available to assess the organ-space SSI outcome.

Discussion and Conclusion

We demonstrate that a **-80mmHg sNPWT device significantly reduces the incidence of composite, superficial, and deep SSIs** when compared with standard care across a heterogenous at-risk orthopaedic and trauma population. The present study therefore demonstrates the clinical efficacy of -80mmHg sNPWT for preventing these SSI sub-types in the context of orthopaedic and trauma patients. Until recently, insufficient data had been available for assessing SSI sub-types in the context of sNPWT. Indeed, it is still the case that organ-space SSIs are currently under-reported as an outcome in the literature. Understanding the impact of sNPWT on SSI sub-types allows clinicians to select a product for their patients that works to reduce the undesirable post-infectious sequelae associated with this complication, such as reoperation or revision surgery. Future meta-analytic investigations may look to analyse either orthopaedic or trauma patients separately in the interest of reducing heterogeneity, as these populations may present with differing high-risk factors.

◇Trademark of Smith+Nephew. All Trademarks acknowledged

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